

FIG. 1

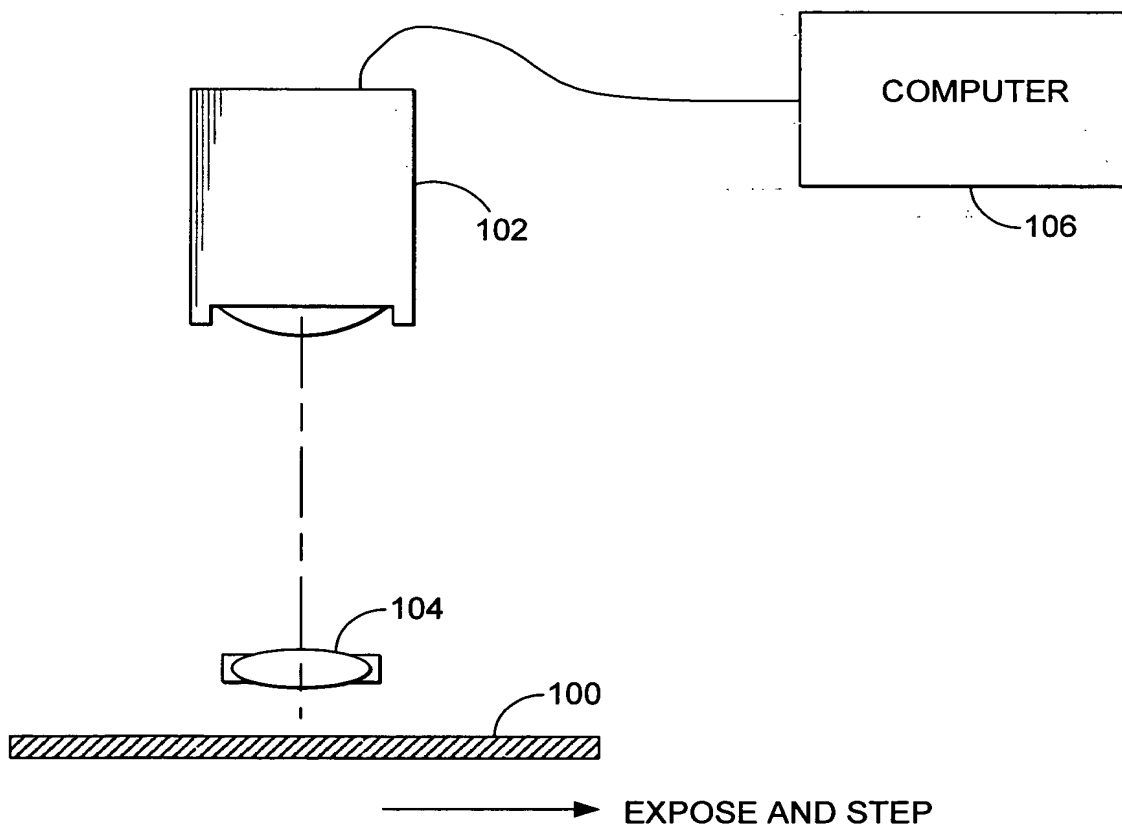


FIG. 4

FIG. 2

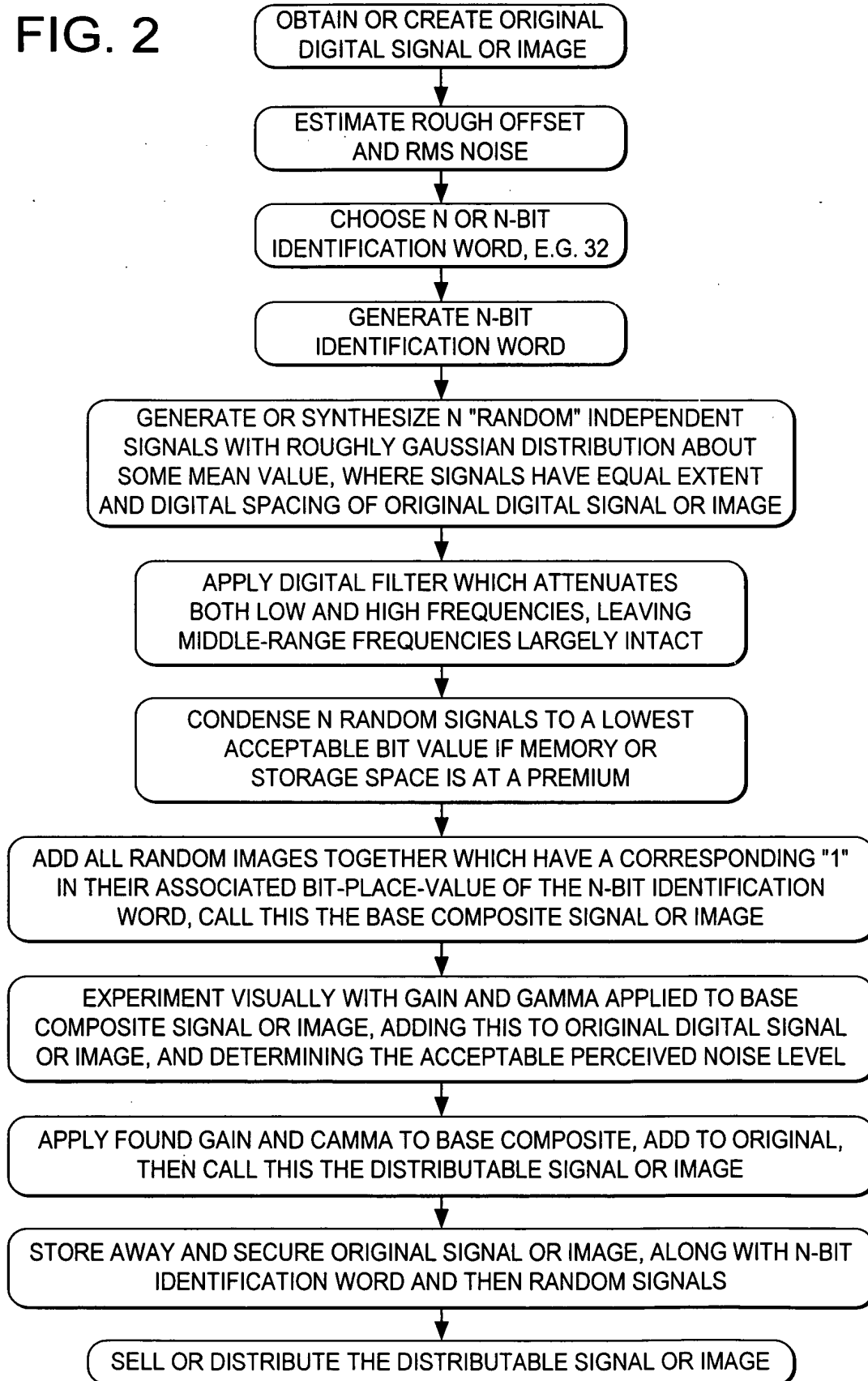
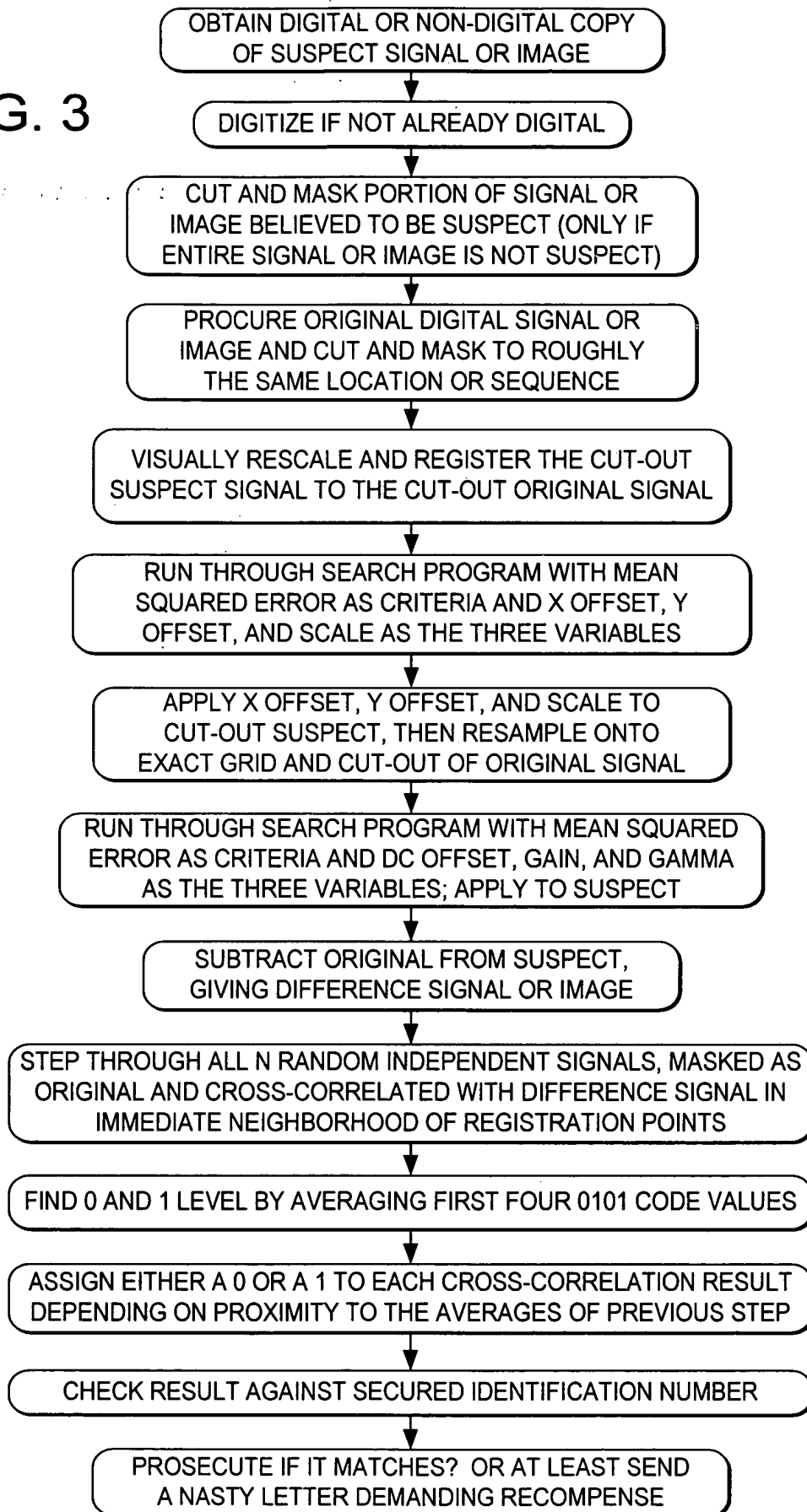


FIG. 3



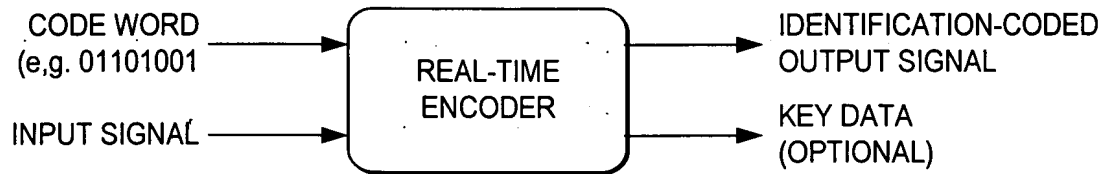


FIG. 5

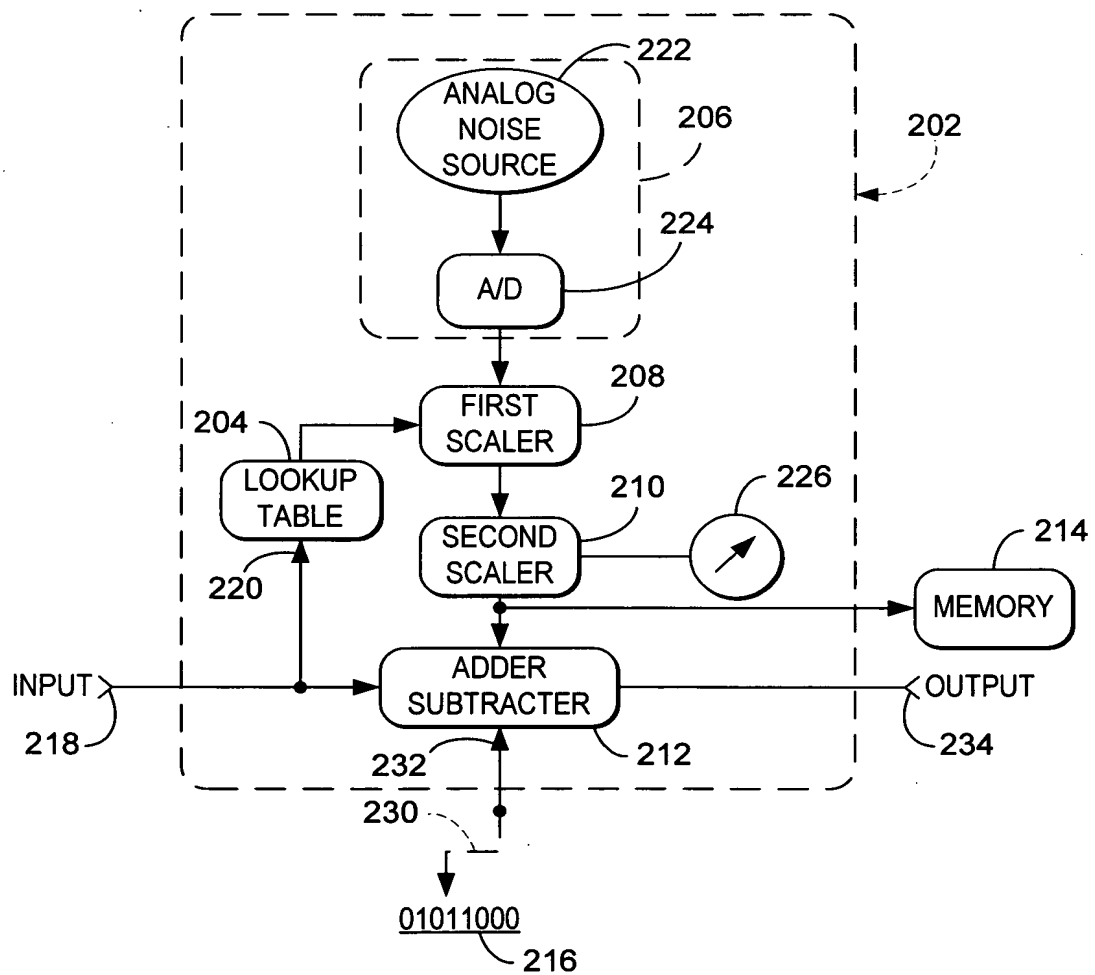


FIG. 6

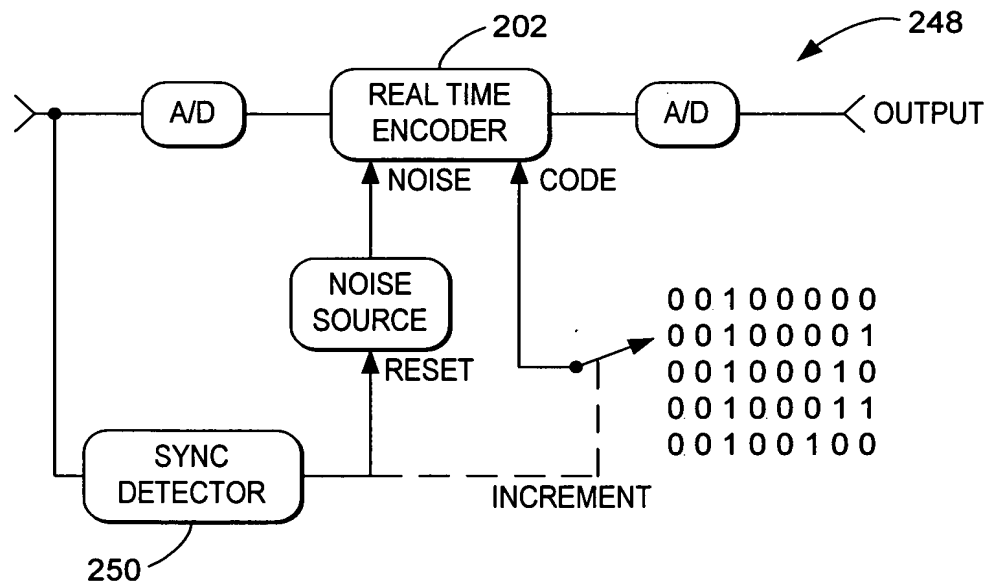
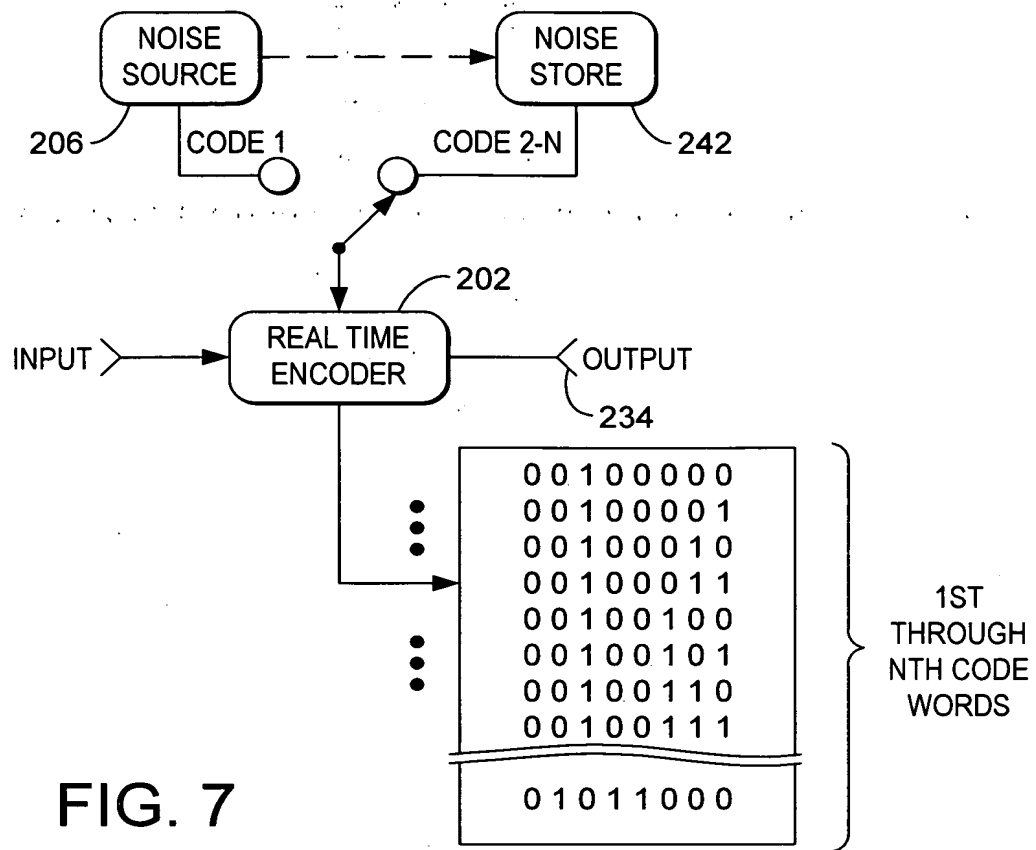


FIG. 9A

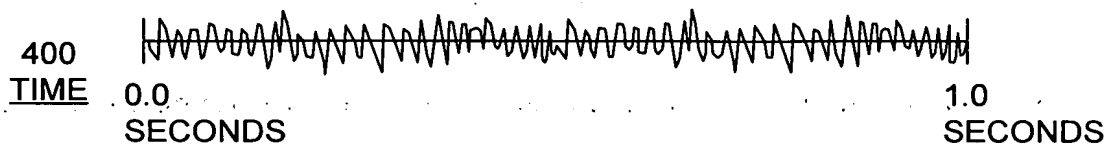


FIG. 9B

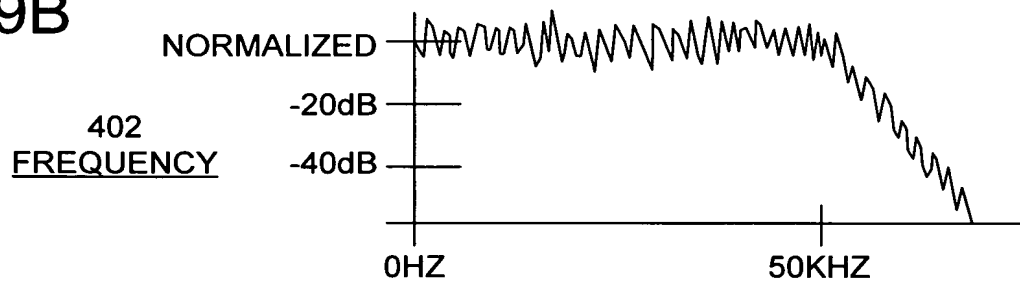


FIG. 9C

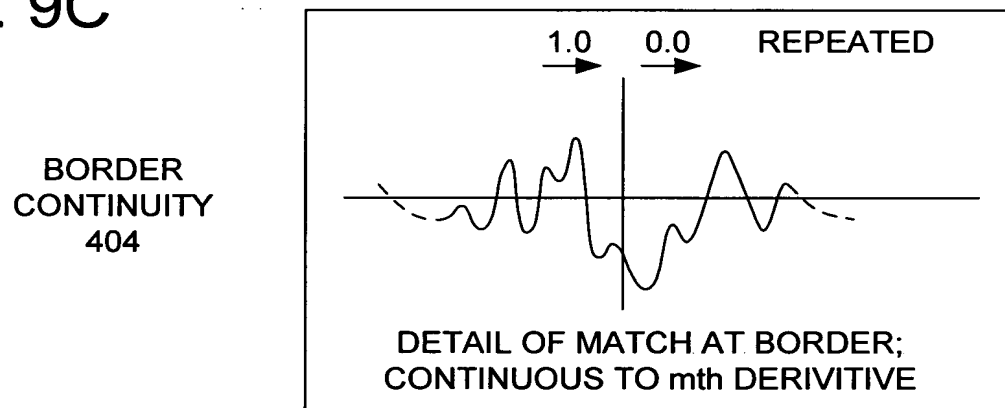


FIG. 10

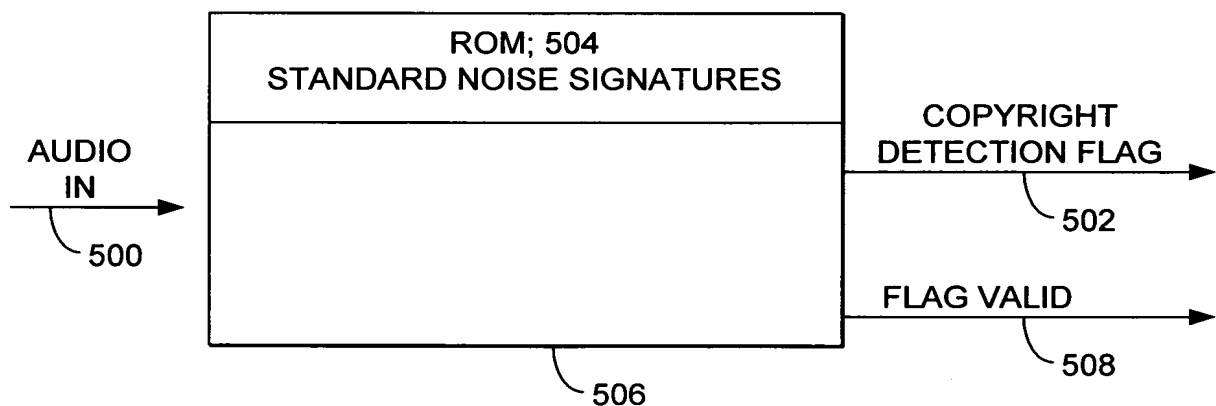


FIG. 11

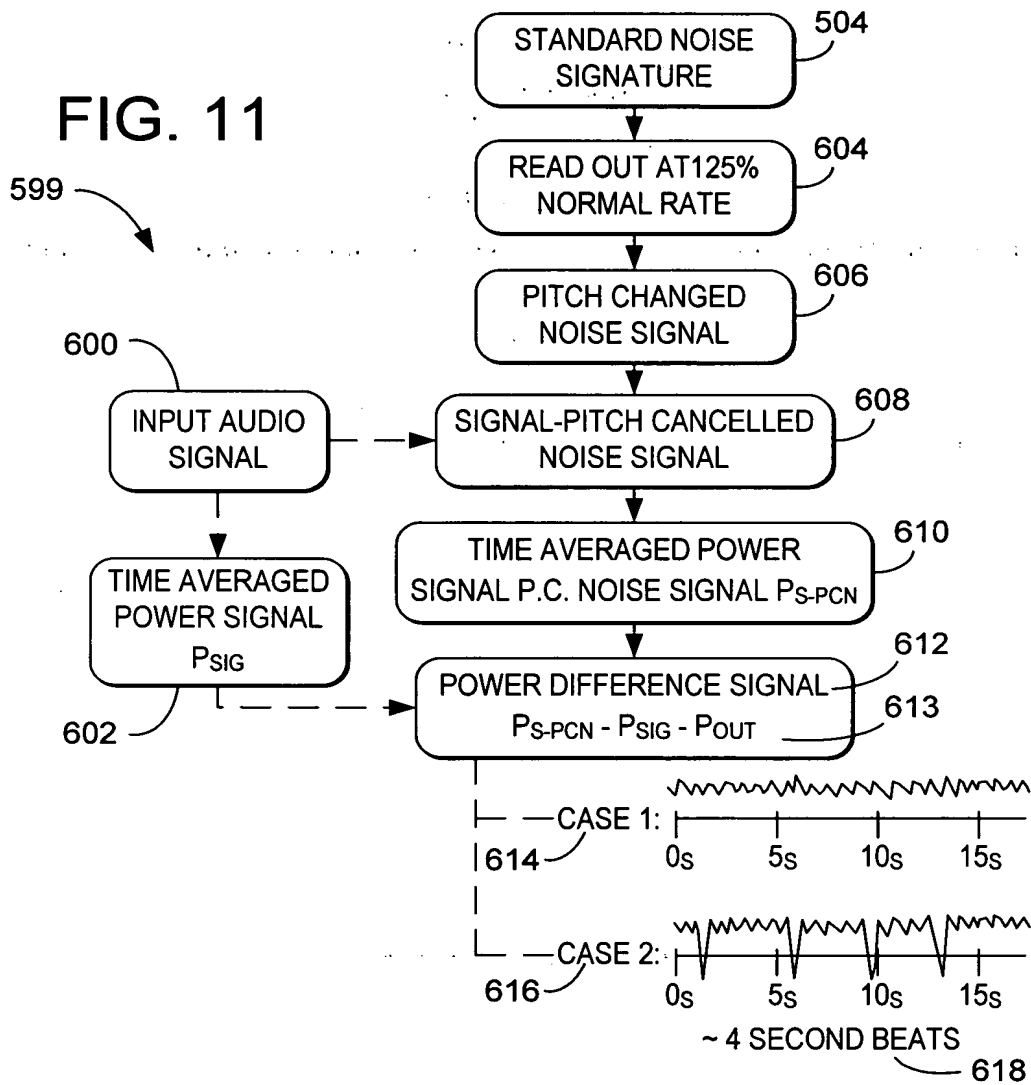
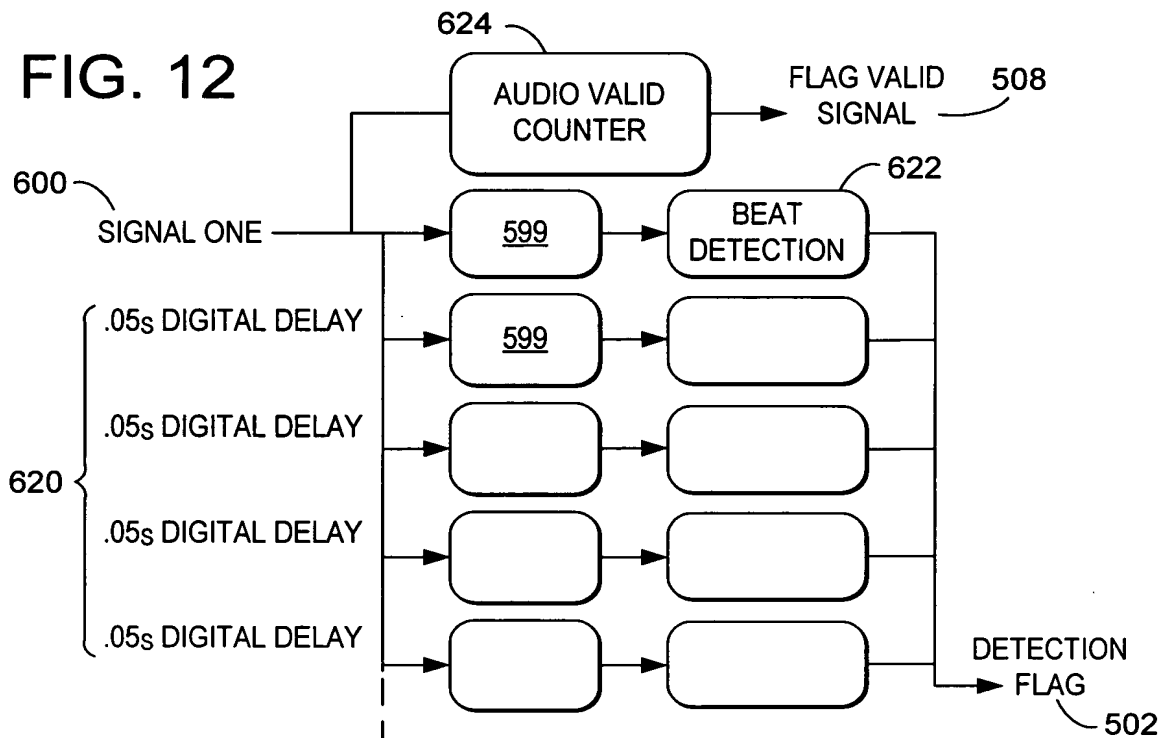
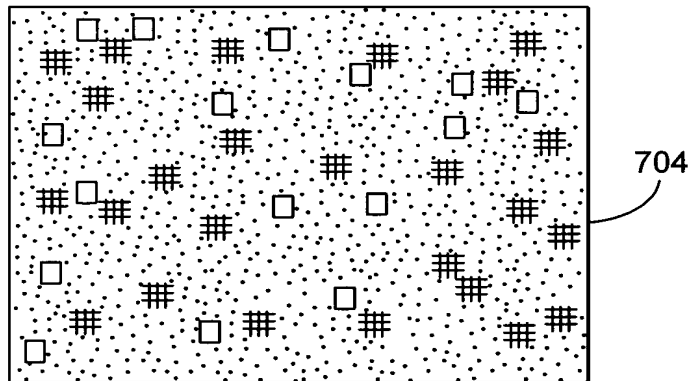
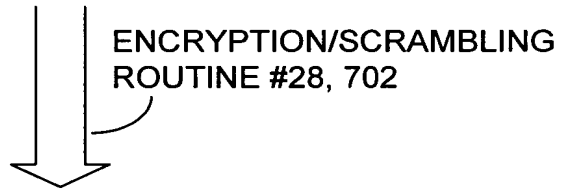
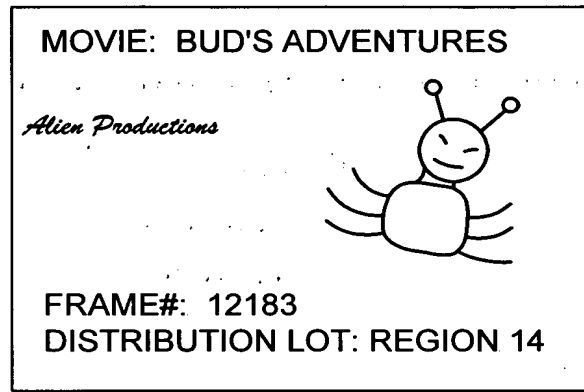


FIG. 12





PSEUDO-RANDOM MASTER SNOWY IMAGE
(SCALED DOWN AND ADDED TO FRAME 12183)

FIG. 13

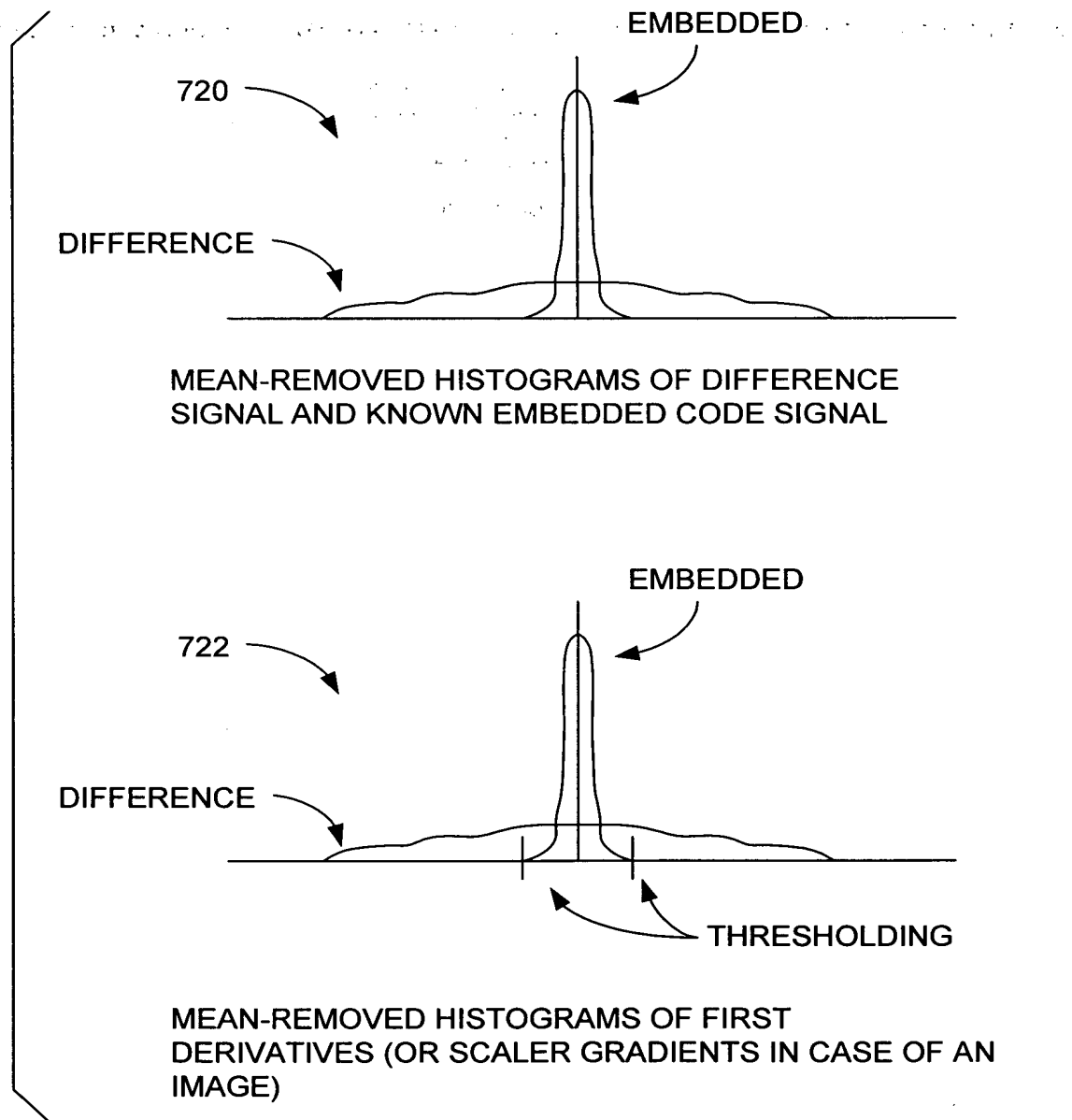


FIG. 14

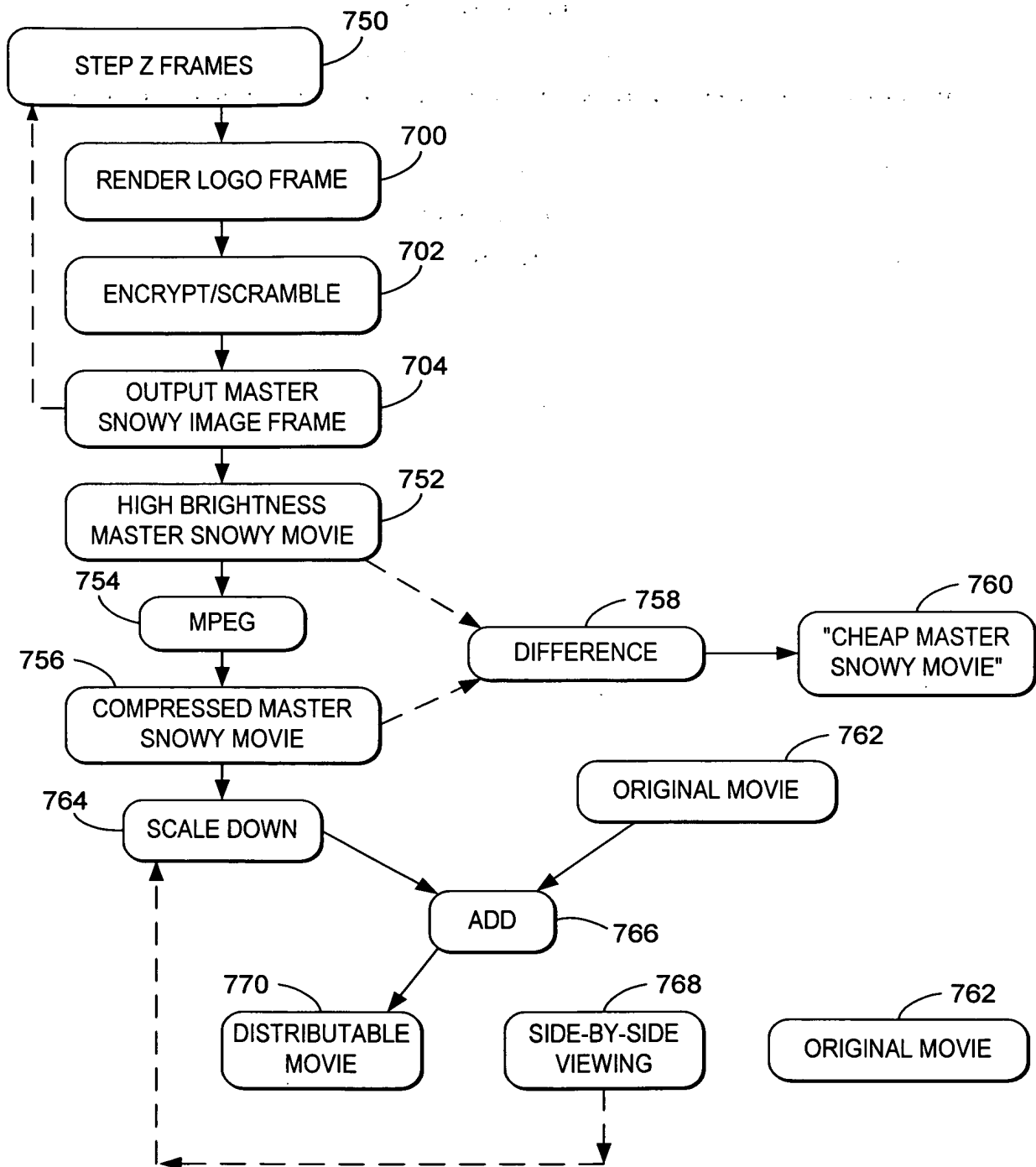


FIG. 15

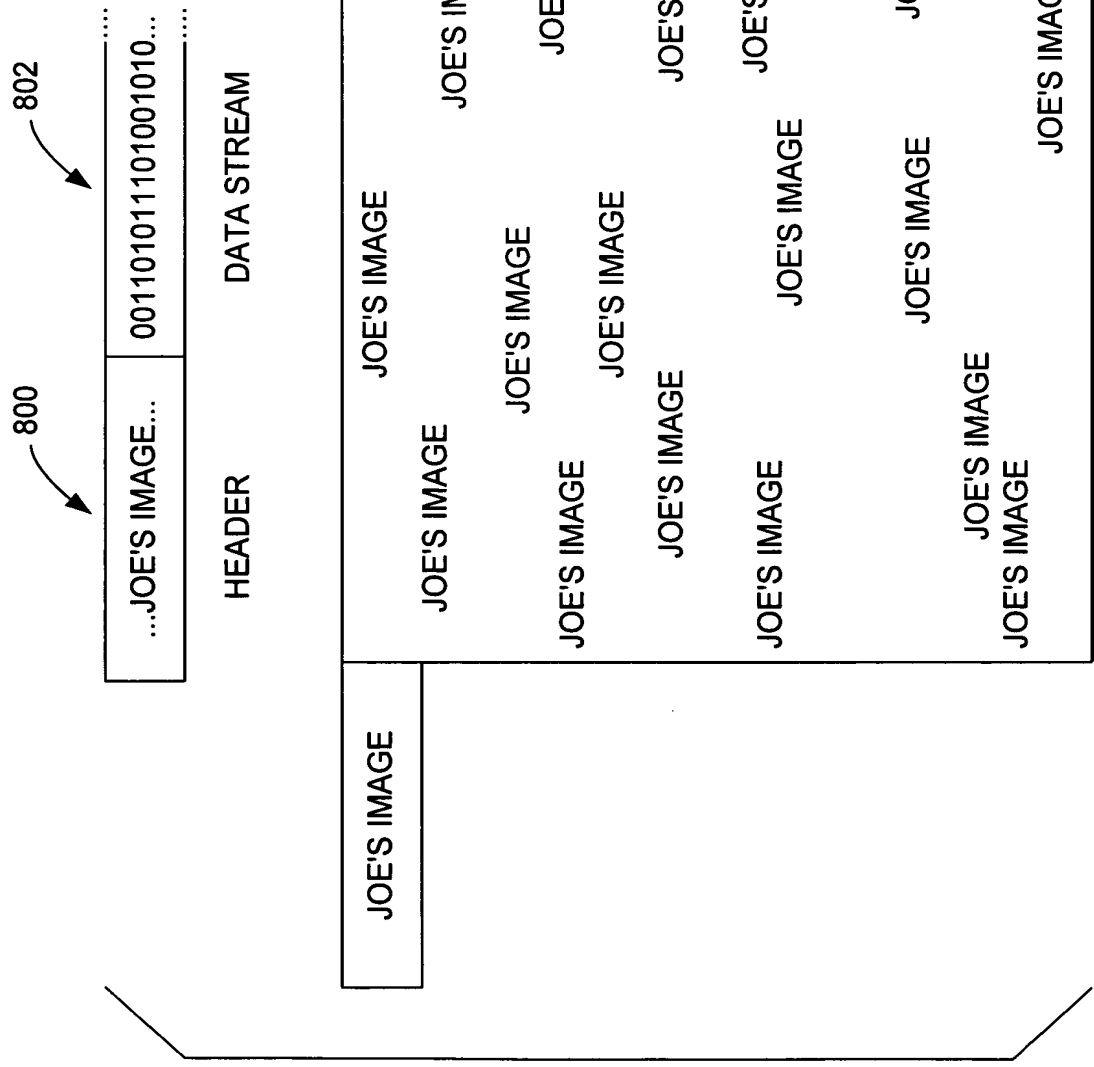


FIG. 16

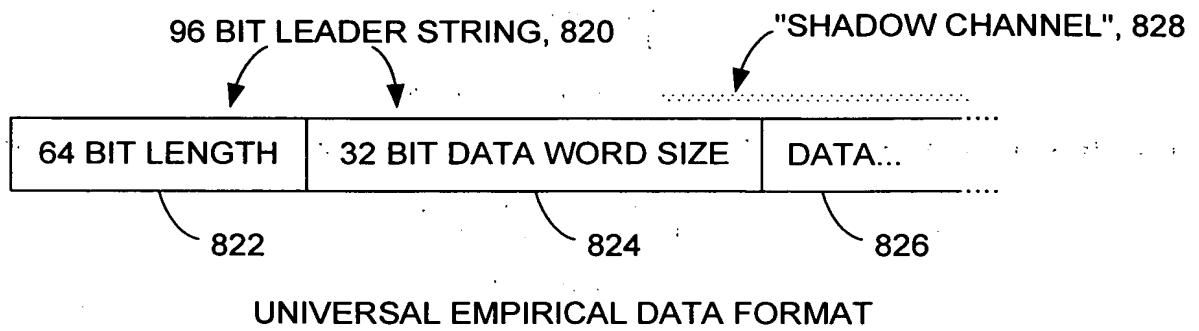


FIG. 17

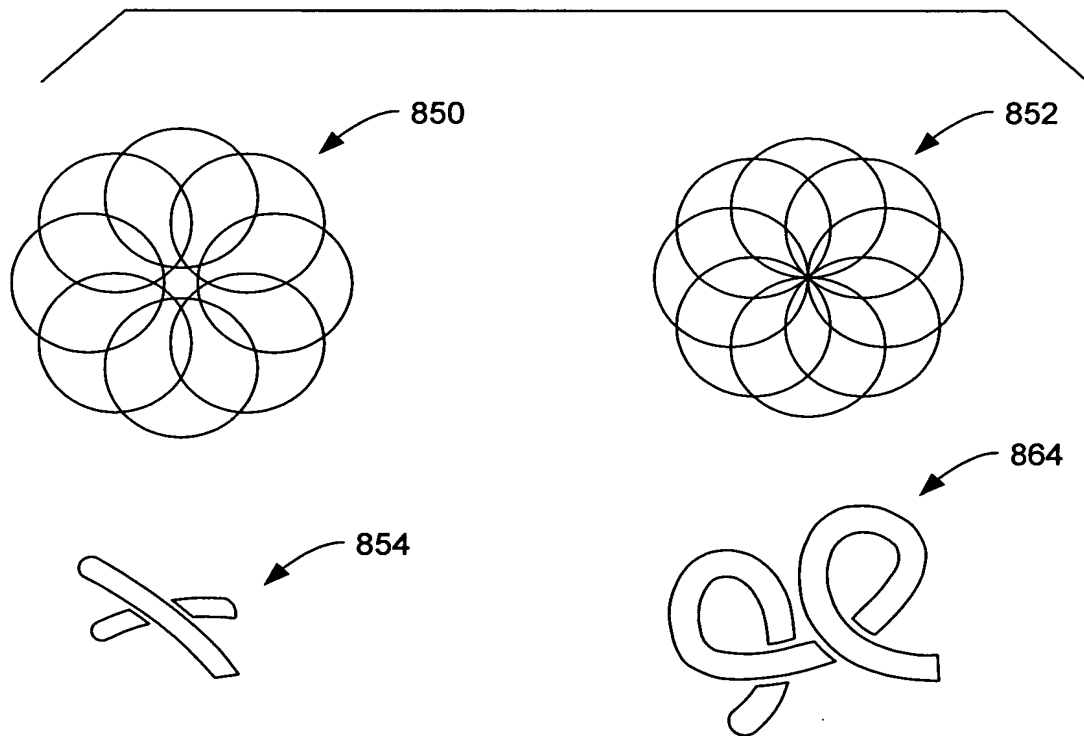
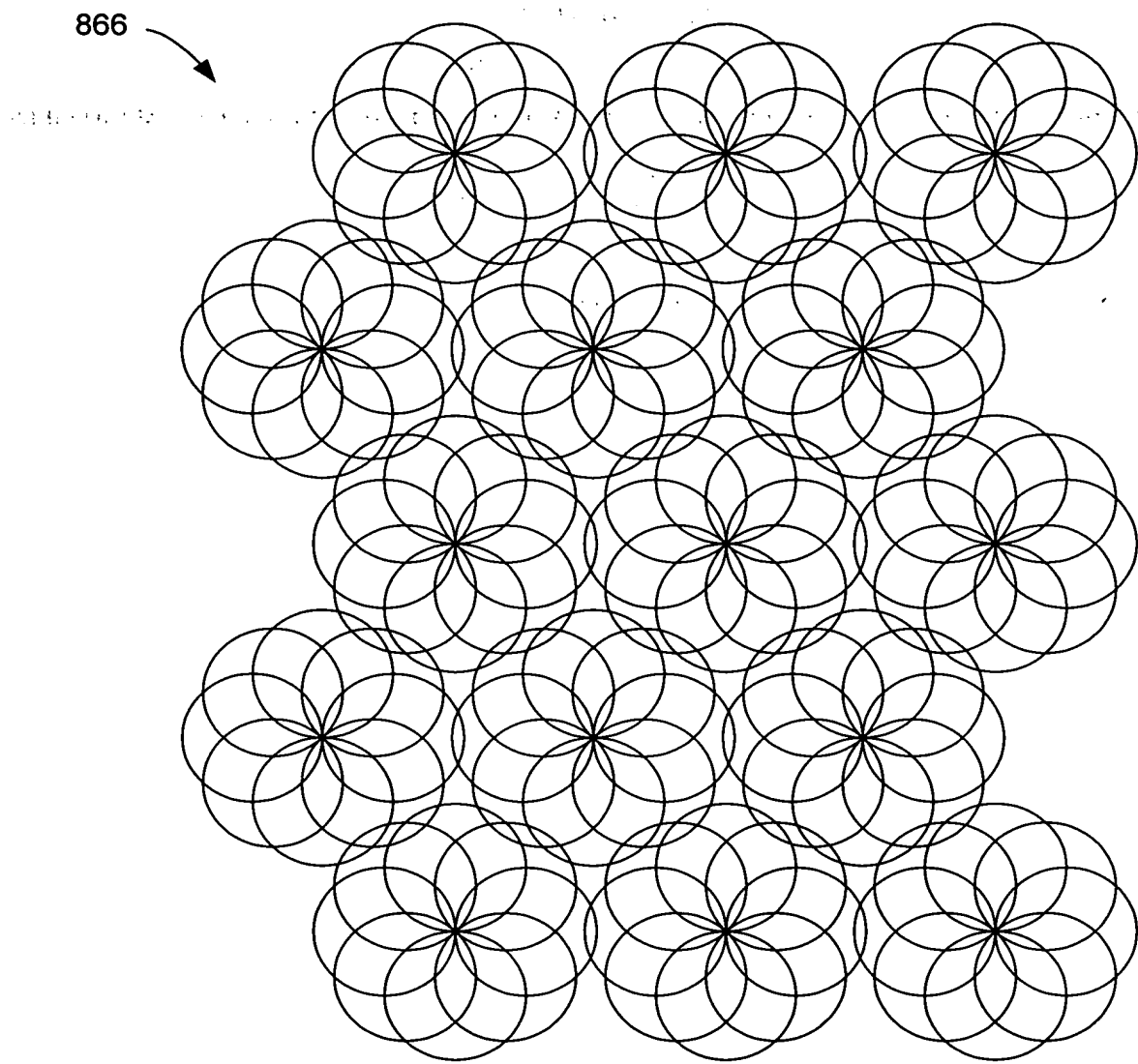
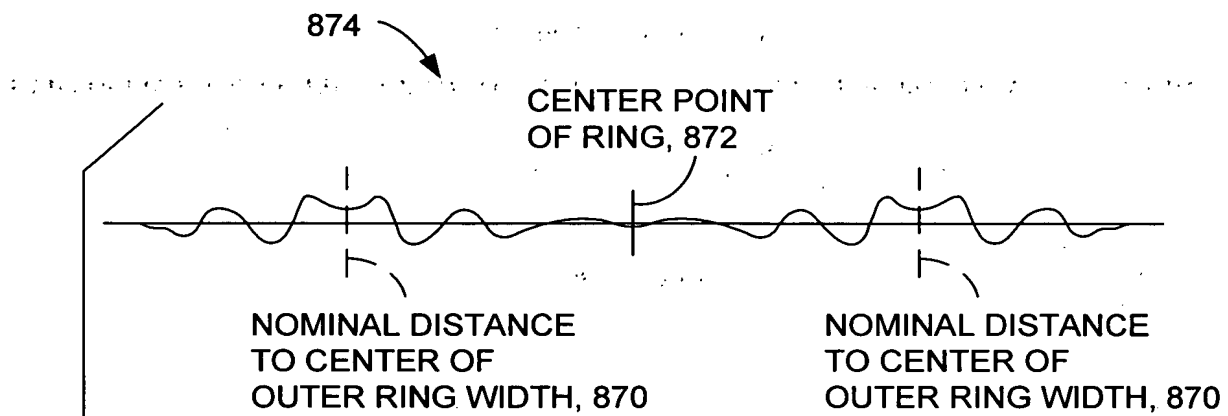


FIG. 18



QUEST FOR MOSAICED KNOT PATTERNS WHICH "COVER" AND ARE COEXTENSIVE WITH ORIGINAL IMAGE; ALL ELEMENTAL KNOT PATTERNS CAN CONVEY THE SAME INFORMATION, SUCH AS A SIGNATURE, OR EACH CAN CONVEY A NEW MESSAGE IN A STEGANOGRAPHIC SENSE

FIG. 19



2-D BRIGHTNESS OF PHASE-ONLY FILTERED RING IS SIMILAR TO THE ABOVE BRIGHTNESS PATTERN ROTATED ABOUT CENTRAL POINT OF RING:

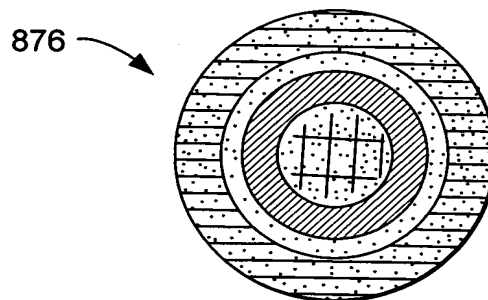


FIG. 20

900

| | | |
|----|----|----|
| C | 2C | C |
| 2C | 4C | 2C |
| C | 2C | C |

WHERE $C = 1/16$

ELEMENTARY BUMP (DEFINED
GROUPING OF PIXELS WITH
WEIGHT VALUES)

FIG. 21A

| | | | | | | | | | | | | | |
|---|--|---|--|---|----|----|----|---|--|---|--|---|--|
| | | | | | | | | | | | | | |
| 2 | | 3 | | 4 | | 5 | | 6 | | 7 | | 0 | |
| | | | | | | | | | | | | | |
| 6 | | 7 | | 0 | | 1 | | 2 | | 3 | | 4 | |
| | | | | | C | 2C | C | | | | | | |
| 2 | | 3 | | 4 | 2C | 4C | 2C | 6 | | 7 | | 0 | |
| | | | | | C | 2C | C | | | | | | |
| 6 | | 7 | | 0 | | 1 | | 2 | | 3 | | 4 | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

EXAMPLE OF HOW MANY ELEMENTARY BUMPS, 900, WOULD BE ASSIGNED LOCATIONS IN AN IMAGE, AND THOSE LOCATIONS WOULD BE ASSOCIATED WITH A CORRESPONDING BIT PLANE IN THE N-BIT WORD, HERE TAKEN AS $N=8$ WITH INDEXES OF 0-7. ONE LOCATION, ASSOCIATED WITH BIT PLANE "5", HAS THE OVERLAY OF THE BUMP PROFILE DEPICTED.

FIG. 21B

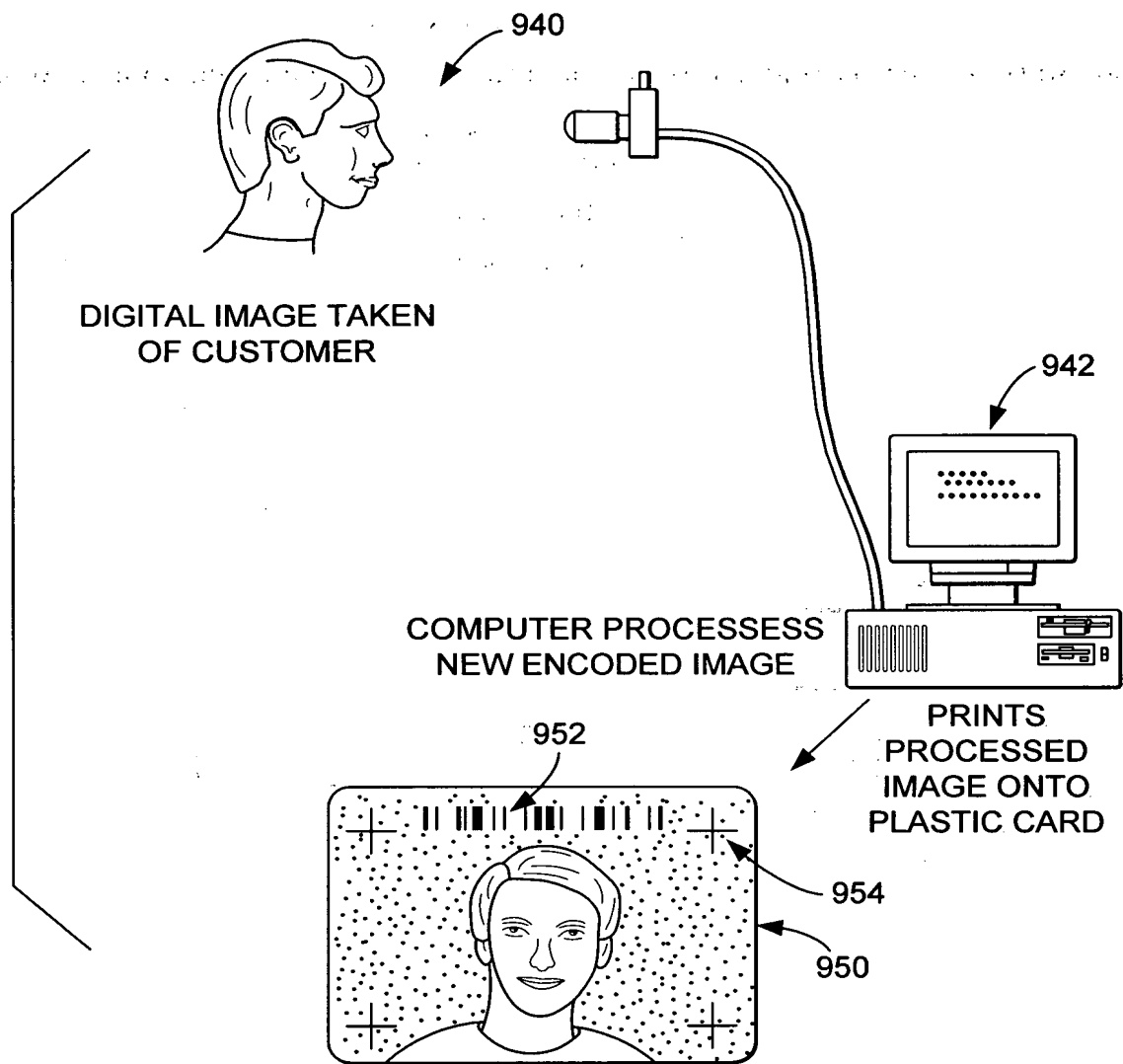
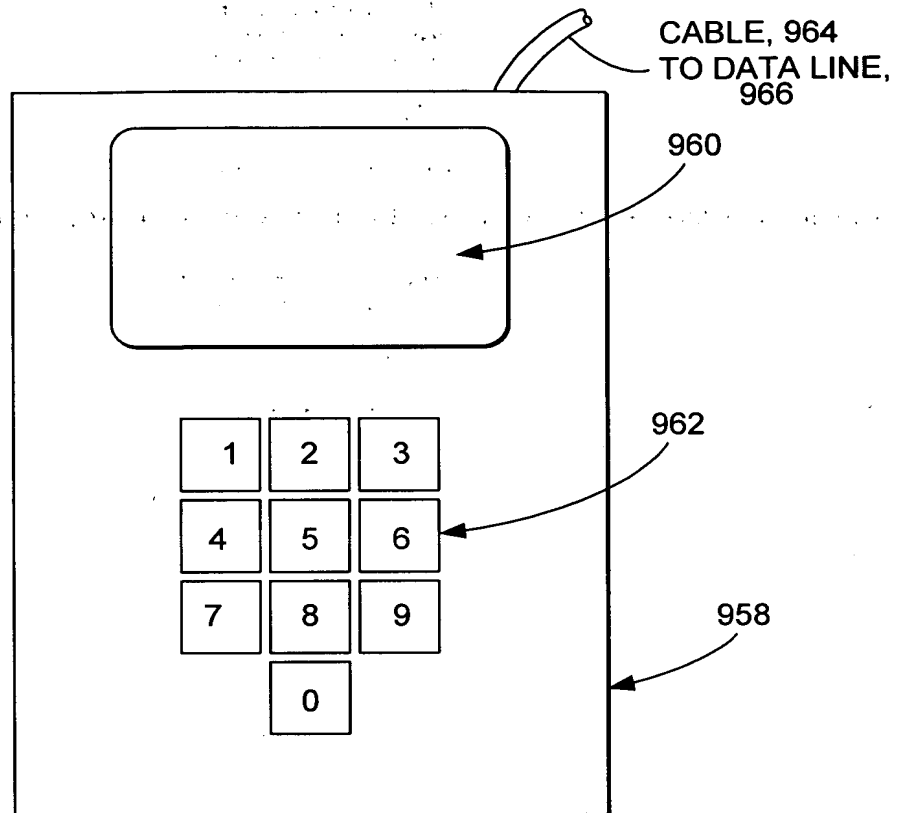


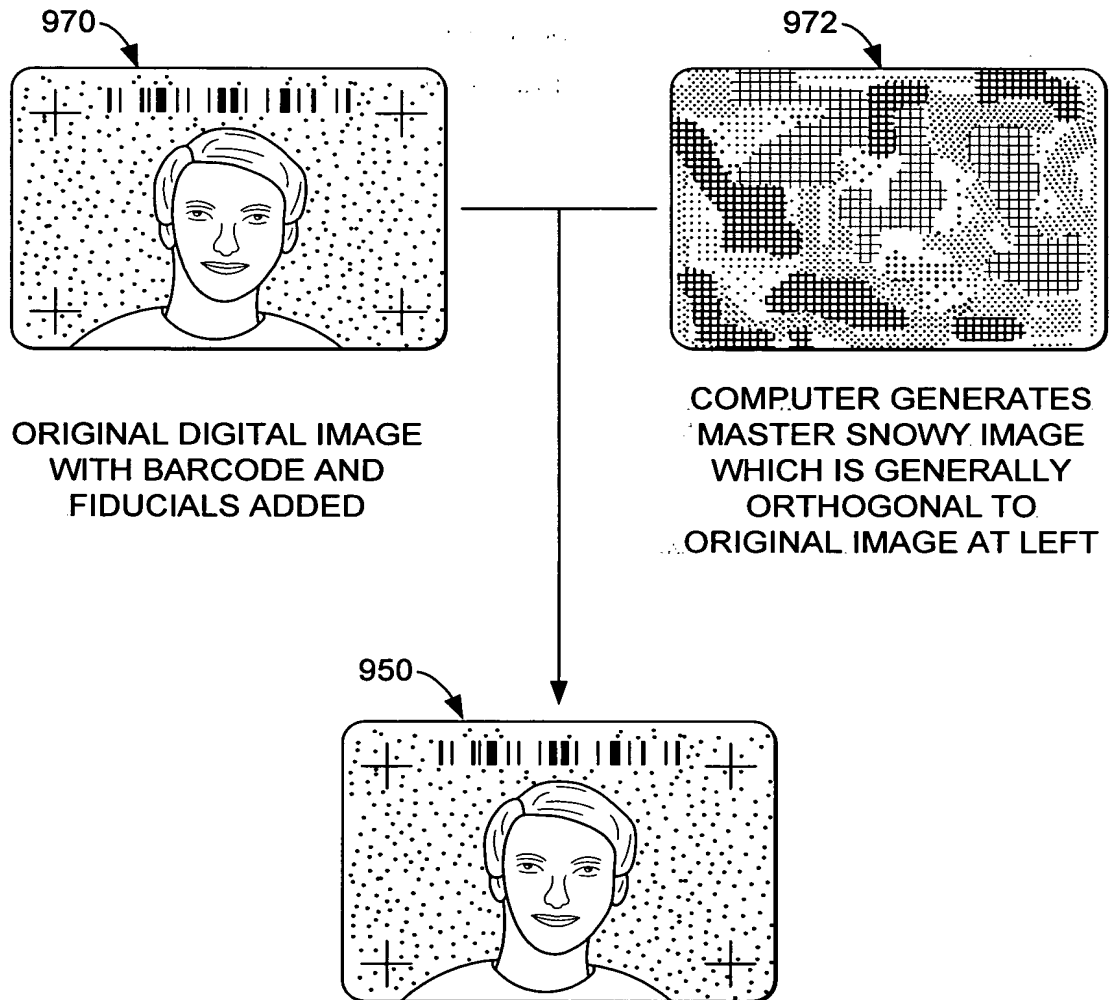
FIG. 22



CONTAINS RUDIMENTARY OPTICAL SCANNER,
MEMORY BUFFERS, COMMUNICATIONS DEVICES,
AND MICROPROCESSOR

CONSUMER MERELY PLACES CARD INTO WINDOW
AND CAN, AT THEIR PREARRANGED OPTION, EITHER
TYPE IN A PERSONAL IDENTIFICATION NUMBER (PIN,
FOR ADDED SECURITY) OR NOT. THE TRANSACTION
IS APPROVED OR DISAPPROVED WITHIN SECONDS.

FIG. 23



COMBINED TO FORM PERSONAL CASH CARD

FIG. 24

TYPICAL TRANSACTION STEPS

1. READER SCANS IMAGE ON CARD, STORES IN MEMORY, EXTRACTS PERSON'S ID
2. OPTIONAL: USER KEYS IN PIN NUMBER
 3. READER CALLS CENTRAL ACCOUNT DATA NETWORK, HANDSHAKES
 4. READER SENDS ID, (PIN), MERCHANT INFORMATION, AND REQUESTED TRANSACTION AMOUNT TO CENTRAL NETWORK
 5. CENTRAL NETWORK VERIFIES ID, PIN, MERCHANT INFO, AND ACCOUNT BALANCE
 6. IF OK, CENTRAL NETWORK GENERATES TWENTY-FOUR SETS OF SIXTEEN DISTINCT RANDOM NUMBERS, WHERE THE RANDOM NUMBERS ARE INDEXES TO A SET OF 64K ORTHOGONAL SPATIAL PATTERNS
7. CENTRAL NETWORK TRANSMITS FIRST OK, AND THE SETS OF RANDOM NUMBERS
8. READER STEPS THROUGH THE TWENTY-FOUR SETS
 - 8A. READER ADDS TOGETHER SET OF ORTHOGONAL PATTERNS
 - 8B. READER PERFORMS DOT PRODUCT OF RESULTANT PATTERN AND CARD SCAN, STORES RESULT
9. READER TRANSMITS THE TWENTY-FOUR DOT PRODUCT RESULTS TO CENTRAL NETWORK
 10. CENTRAL NETWORK CHECKS RESULTS AGAINST MASTER
 11. CENTRAL NETWORK SENDS FINAL APPROVAL OR DENIAL
 12. CENTRAL NETWORK DEBITS MERCHANT ACCOUNT, CREDITS CARD ACCOUNT

FIG. 25

The diagram illustrates a network architecture. A central circle is labeled "CENTRAL NETWORK". It is connected to several other nodes. One node is a large circle, and another is a smaller circle. There are also several small circles connected to the central network. Arrows point to specific nodes: 980 points to the large circle, 982 points to a small circle, and 984 points to another small circle. The connections are shown as lines radiating from the central network to the peripheral nodes.

A BASIC FOUNDATION OF THE CASH CARD SYSTEM IS A 24-HOUR INFORMATION NETWORK, WHERE BOTH THE STATIONS WHICH CREATE THE PPHYSICAL CASH CARDS, 950, AND THE POINT-OF-SALES, 984, ARE ALL HOOKED UP TO THE SAME NETWORK CONTINUOUSLY

FIG. 26

FIG. 27

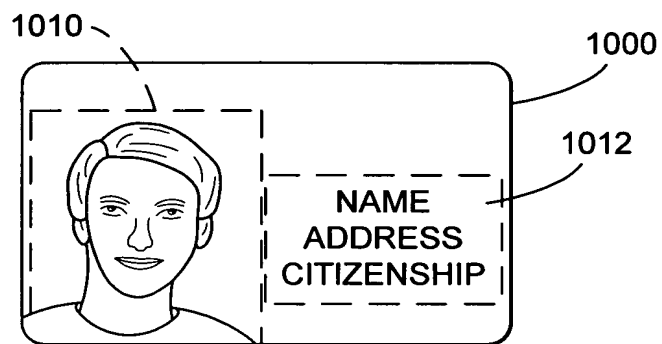
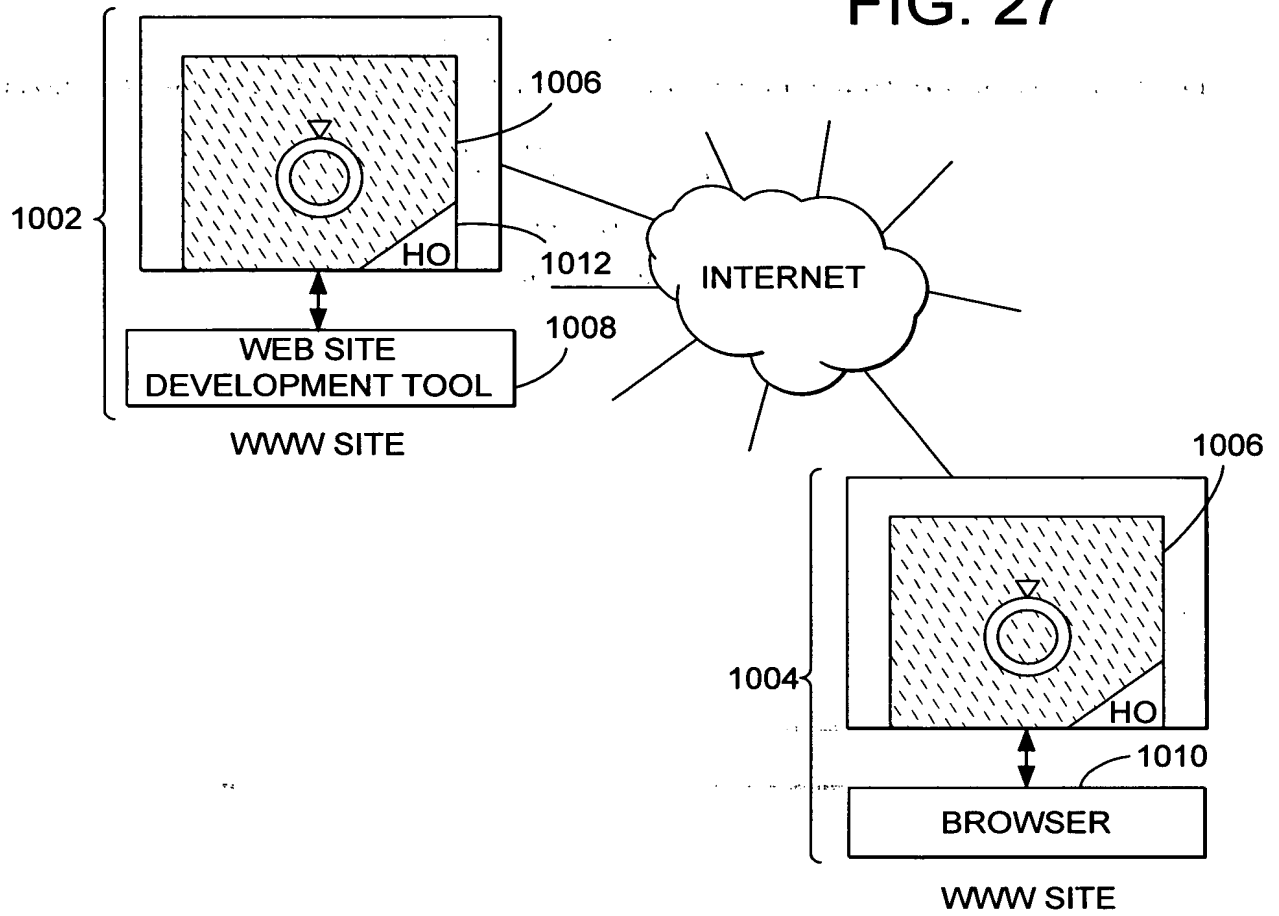


FIG. 28

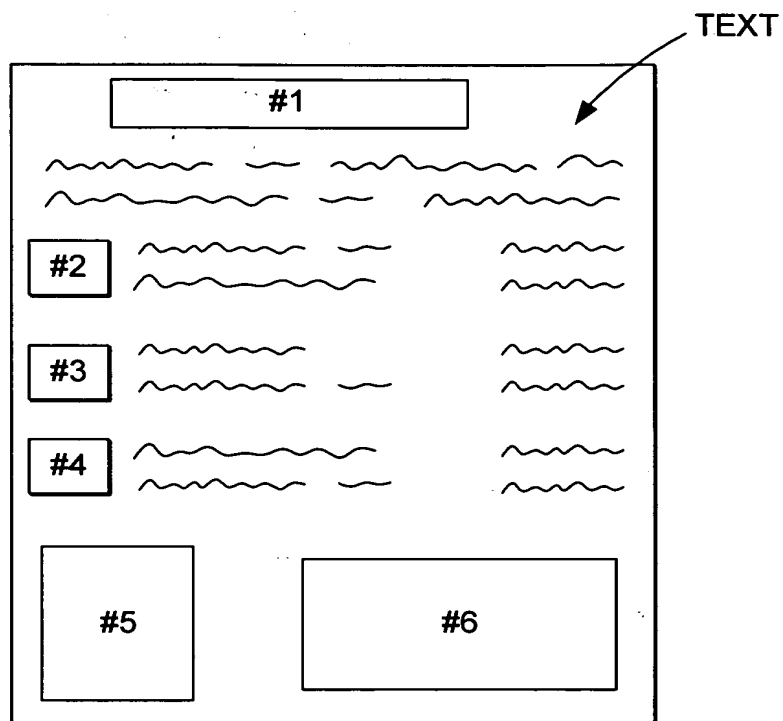


FIG. 27A

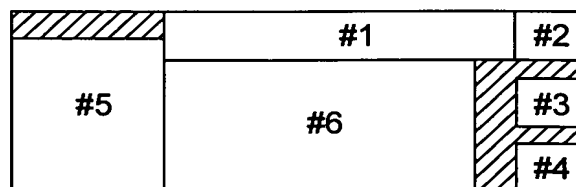
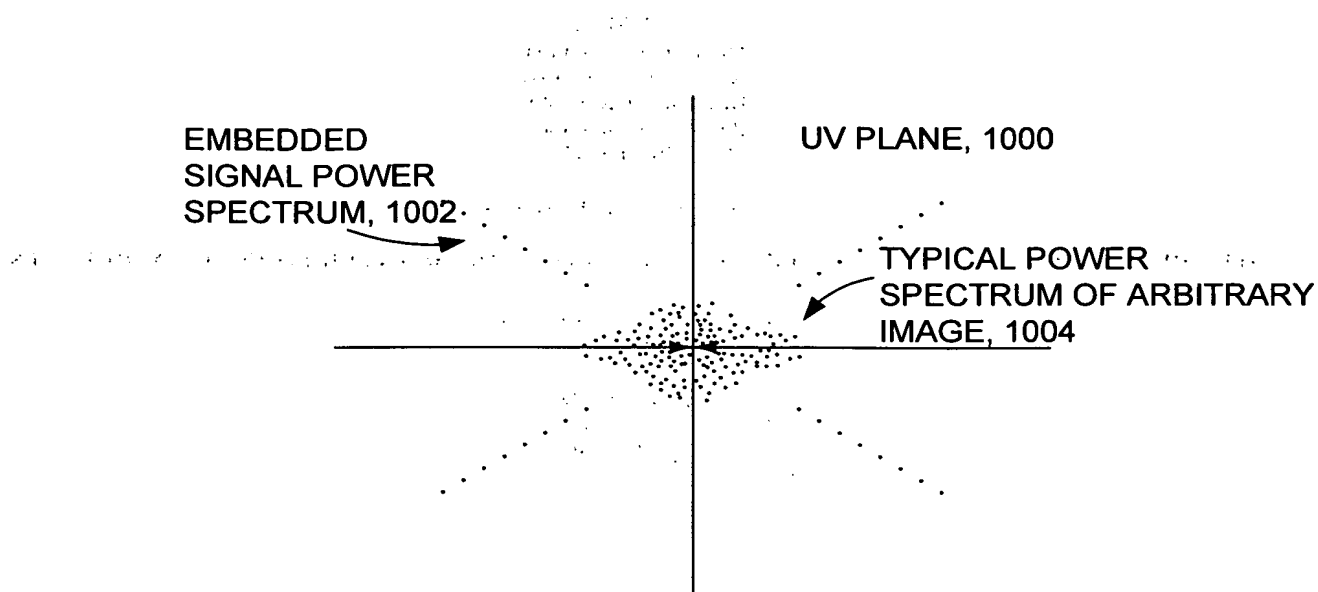
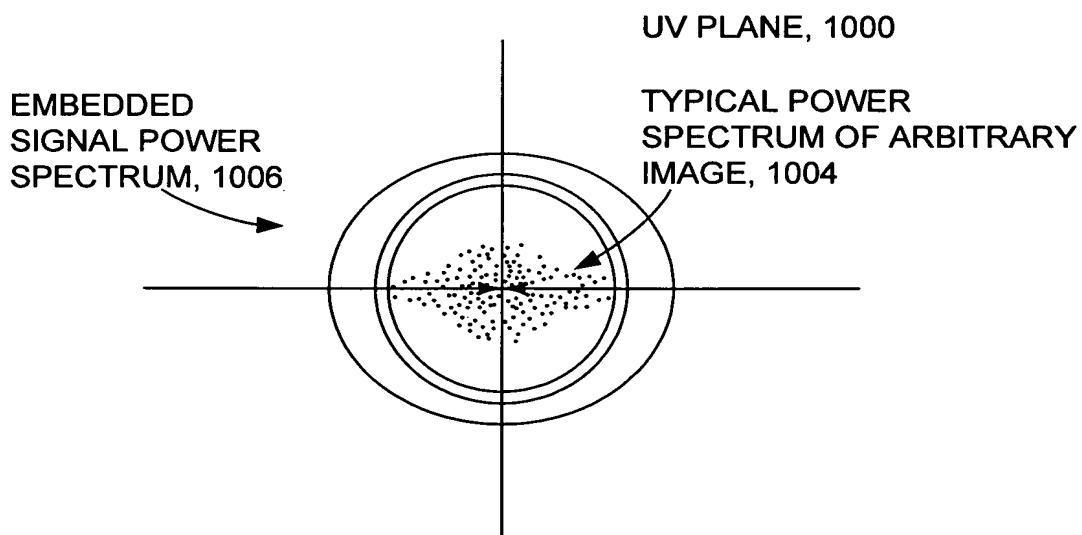


FIG. 27B



NON-HARMONIC SPATIAL FREQUENCIES ALONG THE 45
DEGREE AXES, GIVING RISE TO A WEAVE-LIKE CROSS-
HATCHING PATTERN IN THE SPATIAL DOMAIN

FIG. 29



NON-HARMONIC CONCENTRIC CIRCLES IN UV PLANE,
WHERE PHASE HOPS QUASI-RANDOMLY ALONG EACH
CIRCLE, GIVING RISE TO PSEUDO RANDOM LOOKING
PATTERNS IN THE SPATIAL DOMAIN

FIG. 30

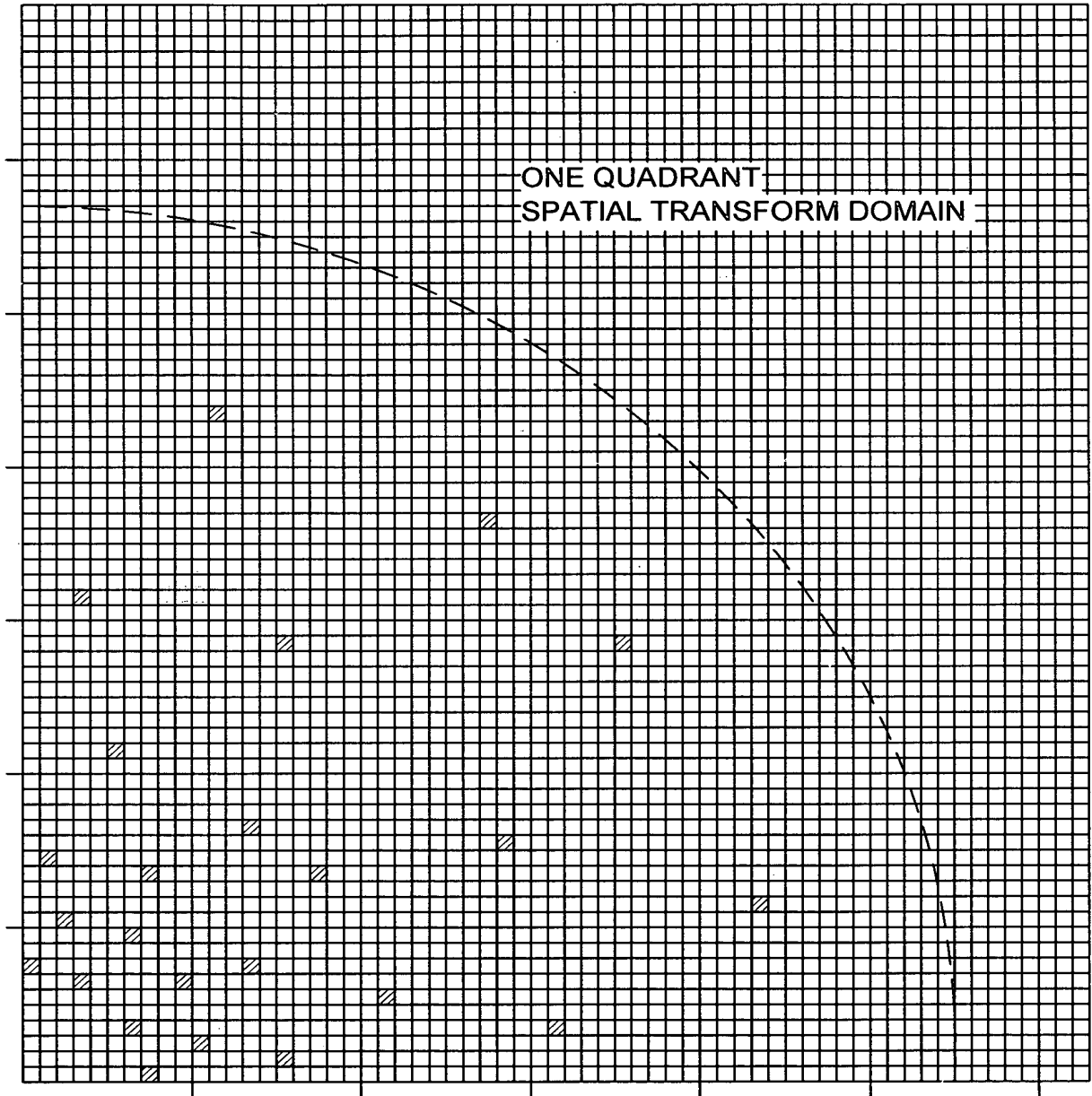
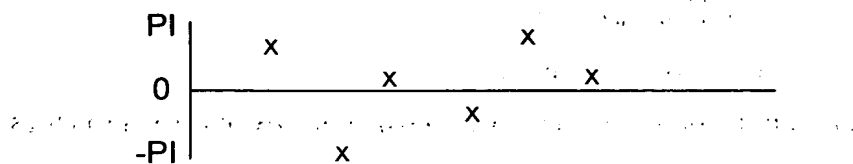
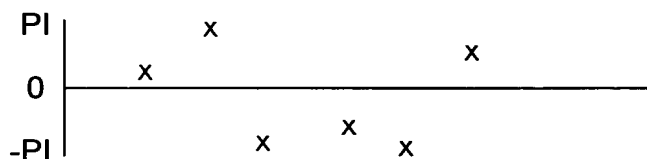


FIG. 29A



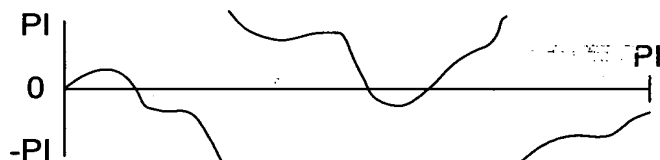
PHASE OF SPATIAL
FREQUENCIES ALONG
FORWARD 45 DEGREE
AXES, 1008

FIG. 31A



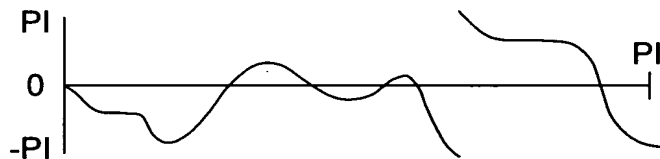
PHASE OF SPATIAL
FREQUENCIES ALONG
BACKWARD 45 DEGREE
AXES, 1010

FIG. 31B



PHASE OF SPATIAL
FREQUENCIES ALONG
FIRST CONCENTRIC
RING, 1012

FIG. 32A



PHASE OF SPATIAL
FREQUENCIES ALONG
SECOND CONCENTRIC
RING, 1014

FIG. 32B



PHASE OF SPATIAL
FREQUENCIES ALONG
THIRD CONCENTRIC
RING, 1016

FIG. 32C

FIG. 33A

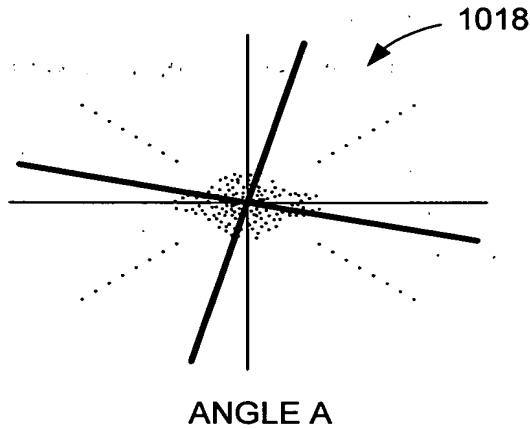


FIG. 33B

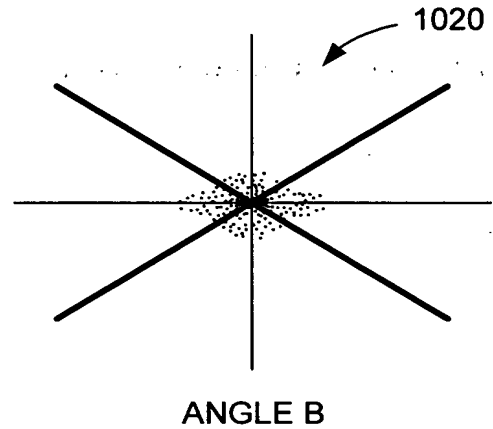
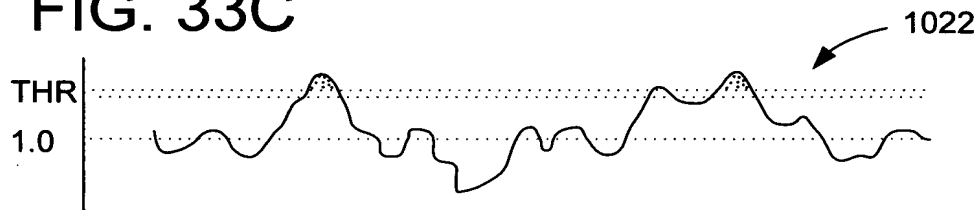
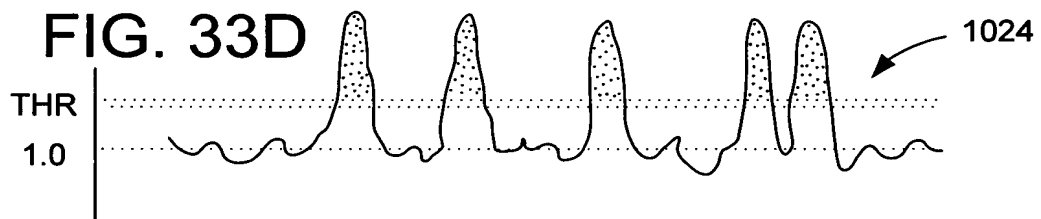


FIG. 33C



POWER PROFILE ALONG ANGLE A, AS NORMALIZED BY ITS OWN MOVING AVERAGE; ONLY A MINIMAL AMOUNT EXCEEDS THRESHOLD, GIVING A SMALL INTEGRATED VALUE

FIG. 33D



POWER PROFILE ALONG ANGLE B, AS NORMALIZED BY ITS OWN MOVING AVERAGE; THIS FINDS STRONG ENERGY ABOVE THE THRESHOLD

FIG. 33E

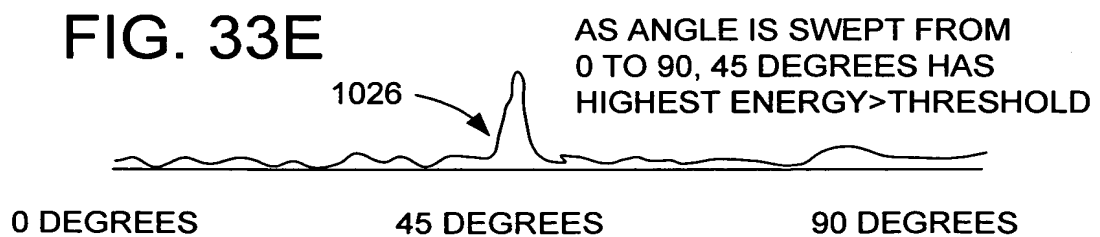


FIG. 34A

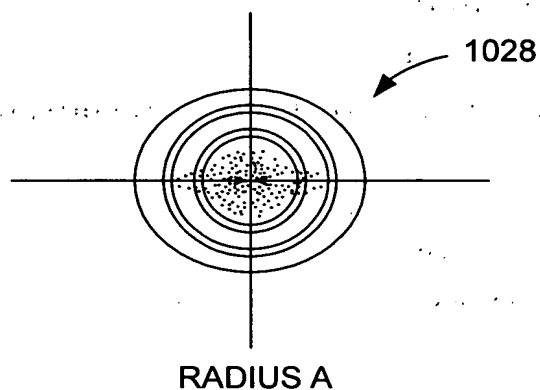


FIG. 34B

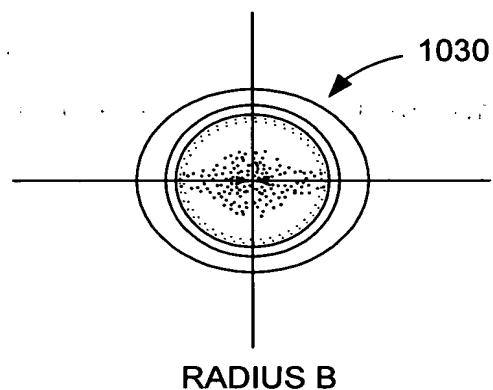


FIG. 34C

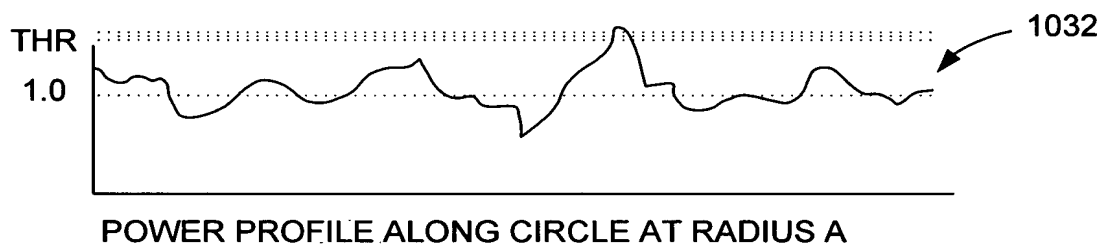


FIG. 34D

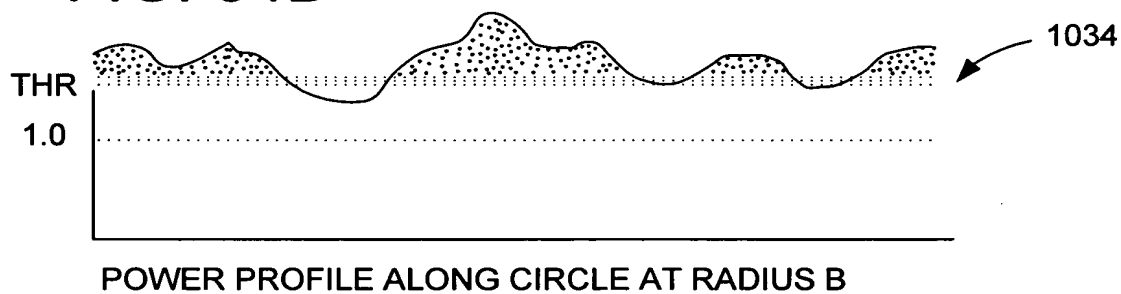


FIG. 34E

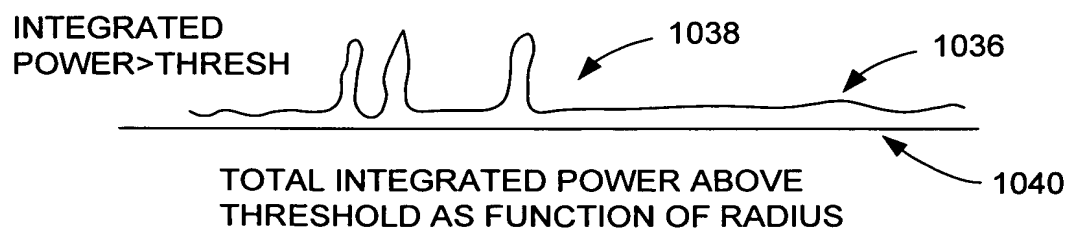
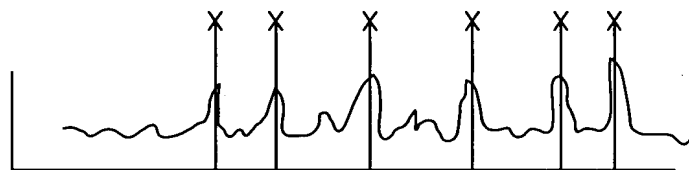


FIG. 35A



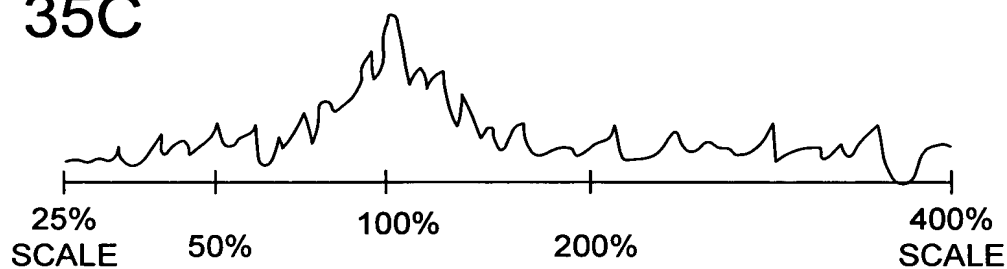
SCALE = A: ADD LL POWER VALUES AT
THE "KNOWN" FREQUENCIES", 1042

FIG. 35B



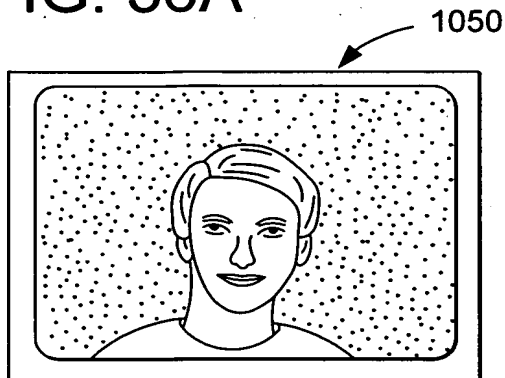
SCALE = B: ADD LL POWER VALUES AT
THE "KNOWN" FREQUENCIES", 1044

FIG. 35C



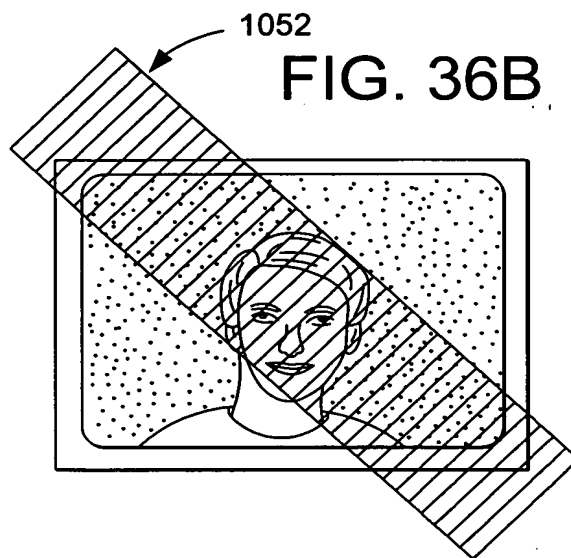
"SCALED-KERNEL" BASED MATCHED FILTER;
PEAK IS WHERE THE SCALE OF THE SUBLIMINAL
GRID WAS FOUND, 1046

FIG. 36A



ARBITRARY ORIGINAL IMAGE
IN WHICH SUBLIMINAL GRATICULES
MAY HAVE BEEN PLACED

FIG. 36B



"COLUMN SCAN" IS APPLIED
ALONG A GIVEN ANGLE THROUGH
THE CENTER OF THE IMAGE

FIG. 36C

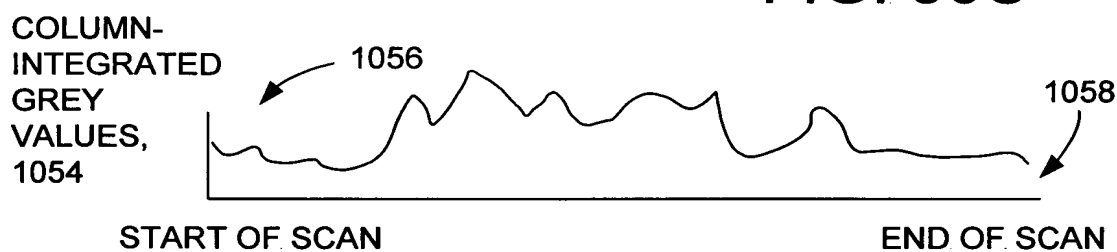
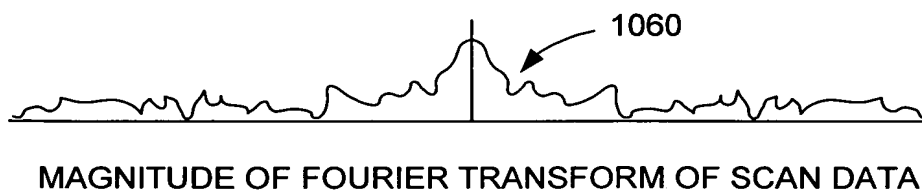


FIG. 36D



PROCESS STEPS

1. SCAN IN PHOTOGRAPH
2. 2D FFT
3. GENERATE 2D POWER SPECTRUM, FILTER WITH E.G. 3X3 BLURRING KERNEL
4. STEP ANGLES FROM 0 DEGREES THROUGH 90 (1/2 DEG)
5. GENERATE NORMALIZED VECTOR, WITH POWER VALUE AS NUMERATOR, AND MOVING AVERAGED POWER VALUE AS DENOMINATOR
6. INTEGRATE VALUES AS SOME THRESHOLD, GIVING A SINGLE INTEGRATED VALUE FOR THIS ANGLE
7. END STEP ON ANGLES
8. FIND TOP ONE OR TWO OR THREE "PEAKS" FROM THE ANGLES IN LOOP 4, THEN FOR EACH PEAK...
9. STEP SCALE FROM 25% TO 400%, STEP ~ 1.01
10. ADD THE NORMALIZED POWER VALUES CORRESPONDING TO THE 'N' SCALED FREQUENCIES OF STANDARD
11. KEEP TRACK OF HIGHEST VALUE IN LOOP
12. END LOOP 9 AND 8, DETERMINE HIGHEST VALUE
13. ROTATION AND SCALE NOW FOUND
14. PERFORM TRADITIONAL MATCHED FILTER TO FIND EXACT SPATIAL OFFSET
15. PERFORM ANY "FINE TUNNING" TO PRECISELY DETERMINE ROTATION, SCALE, OFFSET

FIG. 37